

Acknowledgements

When I came to graduate school, I didn't know how to use Excel or Powerpoint. I didn't know how to efficiently find scientific references. I didn't know the difference between rocks and minerals. I didn't really understand how electron transfer in photosynthesis worked, nor did I care; and while I had a bit of an idea that theoretically, if one was so inclined, one could calculate the free energy yield of a metabolism, I certainly had no idea why one would ever want to do such a thing. Thus, there are many, many people to thank here, as I now know and understand the significance of all these things (and more!) because people here helped and challenged me to learn them.

I must start by thanking and telling the story of how I came to be the graduate student of the person who has had, by far, the most influence on my ability to do the research that I have written about in this thesis – Dianne Newman. I had the outstanding luck to meet Dianne at a key time in my life - the summer before my last year as an undergraduate. It was during this time that I was deciding what graduate schools I would apply to in the fall. I knew two things: that I wanted to go west and that I wanted to do molecular genetics in environmentally relevant microorganisms. I spent that summer doing research in the lab of Roberto Kolter - not so incidentally Dianne's post-doctoral advisor. Dianne was at Wood's Hole that summer TA'ing the Microbial Diversity class - I almost missed her as she didn't come back to the lab until almost the end of summer and my time there! Fortunately she did return and one day over tea we started talking about our future plans, I and my graduate school choices and she and her new position at Caltech, in Pasadena, CALIFORNIA. During my conversation with her I learned a new word - molecular geomicrobiology. I was hooked, and it seemed Dianne would soon need graduate students, but who was this woman? I had only known her a few days, what was she really like? And how the hell was she already a professor at Caltech when she was just 5 years older than me?! A thorough background check and a "rigorous" interrogation over the phone gave me the answers I needed to justify applying to Caltech. And justification I needed, as all my trusted advisors told me: 1) don't go to a school where there is only one person you want to work for, it's too risky and 2) don't work for a new faculty member, it's even more risky! I was made so leery that before I came to visit Caltech for a recruiting weekend, I thought I knew for sure that I wouldn't end up there. How could it possibly compete with my other microbiology powerhouse choices? Once I did visit, however, the beautiful campus setting, the smell of the gardenias, the brilliance of the people and the rocking recruiting weekend all made me to realize that this was no risk I was taking, Caltech and Dianne were a sure thing. As it turns out it, I was right: five and a half years later I have an amazingly, unbelievably, accomplished advisor who has given me countless opportunities and un-ending support and this thesis to prove it. Thank you so much Dianne.

And so, here comes the rest of the list...

Thanks to the NSF, for funding the first three years of my graduate work and providing me with an opportunity to do research in Germany. Thanks also to the Packard Foundation, whose generous support made my project possible.

Thanks to Liz Arredondo, Chi Ma, Jared Leadbetter, Kosuke Ishii, Randy Mielke, Sue Welch and Rebecca Poulson for technical assistance.

Thanks to Tina Salmassi, who also provided technical assistance and who, as my TA for Janet Hering's aquatic chemistry class, helped me endlessly and patiently, taking me from being unable to input log numbers in my calculator to being able to construct Eh/pH diagrams at the drop of a hat (it is because of you that I know how to use Excel!)

Thanks to Clark Johnson and Brian Bead, for patiently helping me learn all the Fe isotopic geochemistry I could handle!

Great thanks to Professors Friedrich Widdel and Bernard Schink, who allowed me the amazing opportunity to work in their labs in Germany for a summer. I couldn't have asked for a more worthwhile and fulfilling graduate experience.

Thanks to Arash Komeili, Jeff Gralnick, and Andreas Kappler for being a constant source of reference and aid and to all the Newman Lab members past and present, for continual helpful scientific discussion as well as entertainment! In particular, thanks to Yongqin Jiao for being a BIF team member extraordinaire! Without your help and support over the past five months, those cell suspension assays would NEVER have gotten done!

Thanks to all my friends at Caltech who have made my time here more enjoyable, my girl's lunch crew in particular!

Thanks to my previous mentors and teachers: Diana Downs, Julie Zilles, Jorge Escalante, Roberto Kolter, Paula Watnick, Enrique Massa, and Fred Kittel for preparing me well for the challenge of graduate school.

Thanks to my committee members, Mel Simon, George Rossman, Elliot Meyerowitz, and Joe Kirschvink for their time and support.

And finally, special and profound thanks to: 1) my brother and sister who offered invaluable support and humor over the years, 2) my mother who constantly reminded me and demonstrated that all I had to do was say the word and she would be here, if for nothing else than to just make me dinner, 3) my father, who through a two hour phone conversation at a crucial time, helped me find the strength to continue my work here and helped me come to the decision, once and for all, that obtaining this degree would not be the first challenge in my life that I would not rise to meet and 4) Chris, who was there to make me that dinner when my mother wasn't and who offered unconditional and complete support through out it all. Words can't express how much I love you all and how grateful I am for your support. Without you five, I most certainly would not be where I am today.